CONSERVATION METHODS

FOR THE UPPER MISSISSIPPI VALLEY (FAYETTE SOIL AREA)

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Cover photograph: Aerial view of the Upper Mississippi Valley Soil and Water Conservation Station. The terrain is typical of the Fayette Soil area. (Courtesy of La Crosse Tribune [Wis.])

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CONSERVATION METHODS

FOR THE UPPER MISSISSIPPI VALLEY (FAYETTE SOIL AREA)

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The Fayette soil area is one of the most severely eroded farming areas in the North Central States. It comprises 12 million acres in southwestern Wisconsin, southeastern Minnesota, northeastern Iowa, and northwestern Illinois. It includes, besides Fayette, such soils as Dubuque, Clinton, and stony land, but is characteristically made up of grayish-brown, hilly silt loams.

Thousands of tons of good top soil are being washed away every year. Most sloping fields have eroded to the extent that subsoil is being turned by plowing.

Dairying is the chief agricultural enterprise in the Fayette soil area. Cropland is used mostly for growing corn, grain and hay—crops necessary to dairying. About half of the farmland is used for pasture, but of this amount, 39 percent is pastured woodland. It is estimated that about 80 percent of the woodland on farms is being pastured.

Effective control measures in this area are vitally important to halt the continued loss of productive fields.

Erosion damage

Erosion damage in the Fayette soil area is especially high because of the intense rains and the steeply sloping fields. In addition, the soil is a type that erodes easily.

This erosion leaves its mark in a number of ways. During a severe storm, runoff water becomes laden with silt. Deposits, or "fans," of silt accumulate in sod or hay below fields of corn or grain. Rills and gullies form in cultivated fields. Crop growth is slow; plant color becomes lighter; yields drop.

An eroded soil is harder to work than a noneroded soil. It holds less available water, requires more power to plow, and needs more fertilizer.

Severe rains in the growing season cause most of the water runoff and soil erosion in the Fayette area. Soil is normally frozen and covered with snow from mid-November to mid-April. Runoff from thawing snow causes little soil erosion. However, if a rain occurs when the soil surface is partially thawed, losses are high on fields unprotected by vegetation. The thawed surface soil slides easily over the frozen soil.

Heavy rains may occur in any month from March to November. They occur most frequently, however, during June, July, and August. If heavy rains occur when the vegetative cover is dense, soil losses are low. If they occur at the time of seedbed preparation or before a thick cover crop is established, soil losses are high. Research records at the La Crosse (Wis.) Soil and

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Water Conservation Station [1] show that, on the average, 4 rains each year cause 95 percent of the soil loss and 84 percent of the water runoff from corn fields.

How crops affect erosion

Crops vary in the amount of protection they give. The lowest losses occur on hay land; the highest on fields planted to spring grain. Tests at the La Crosse station show the following results in a 5-year rotation of corn, grain, and 3 years of hay:

Crop:	*Water runoff (inches)*	*Soil loss (tons per acre)*
Corn	2. 4	4. 9
Oats	4. 3	11. 4
Hay (1st year)	3. 3	. 7
Hay (2d year)	3. 4	. 3
Hay (3d year)	3. 0	. 3

Losses were even higher for a 3-year rotation of corn, grain, and 1 year of hay.

Here are the reasons for these differences:

In a rotation where corn follows hay, the soil contains considerable raw organic matter and has improved structure because of growing and plowing under grasses and legumes. Soil is quite rough. In contrast, where grain follows corn, the soil contains little raw organic matter because the stover is usually removed from the field. Cultivating the corn has also produced a finely divided soil that seals over and erodes easily.

[1] Agricultural Research Service, USDA, in cooperation with the College of Agriculture, University of Wisconsin.

The chart on page 6 shows how raw organic matter and soil structure affect erosion losses, even though the cover crop has about the same density. Continuous corn was compared with corn grown in a 3-year rotation. Note the rapid rise in soil losses after the second year of continuous corn.

The stage of plant growth also affects the amount of erosion loss. Small seedlings give little protection. As plants grow, they give greater protection.

How seasons affect erosion

Soil erosion losses are very low from October through February. January and February thaws account for only 2 percent of the annual loss. As the temperature increases in March, snow begins to thaw more rapidly and soil losses climb.

A 10-year test on soil losses by months from corn, grain, and hay in a 5-year rotation shows the following results:

● Extremely high losses during April, May and June from land plowed for spring grain. The critical period began as soon as the seedbed was prepared, and continued until plant growth was heavy enough to offer protection. In this test a 7-ton soil loss was recorded during May.

● Moderate losses during June and July from land plowed for corn. During April and May the residue from the previous hay crop and the good soil structure built up during the hay years helped to

reduce losses. Cultivation of the corn caused the soil to erode more easily. As a result, erosion increased during June and continued high until August when the crop gave more protection. In this test a 2-ton soil loss was recorded in June.

● Low soil losses from hay fields during each month of the year. Hay was a mixture of alfalfa and bromegrass. In this test the highest soil loss—0.14 ton—occurred in July.

Controlling erosion

Farmers in the Fayette soil area can reduce soil erosion and water runoff by following approved crop practices and by using thoroughly tested conservation aids.

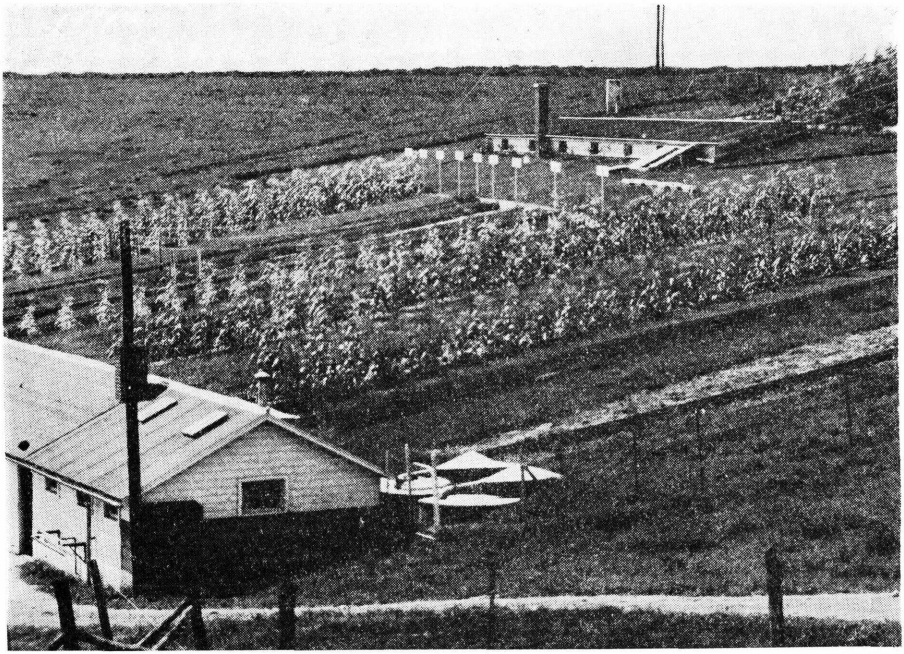
CROP PRACTICES

Corn

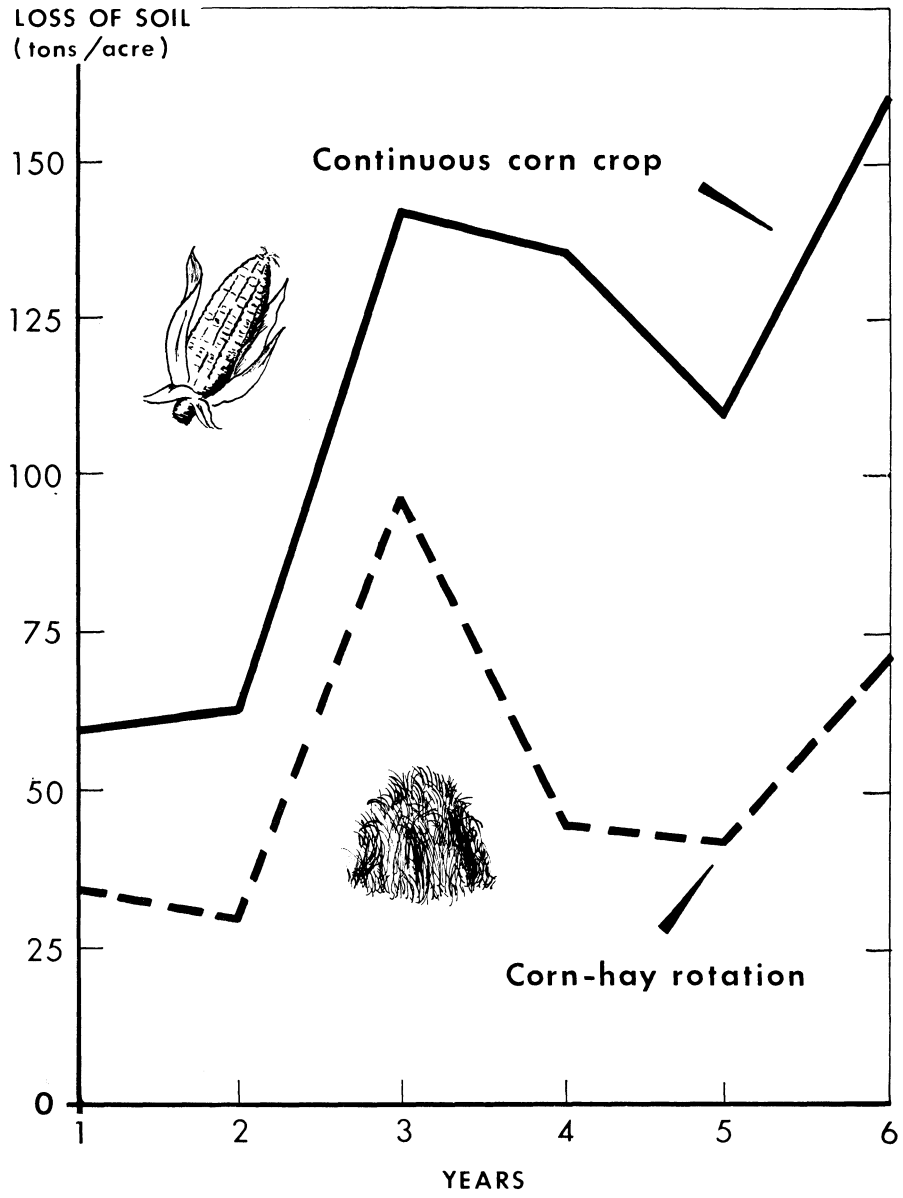
PLOW-PLANT.—This method of planting corn eliminates cultivation between plowing and planting. The plow should be adjusted so that each furrow is well crested and all vegetation is covered. Plow on the contour. Turn the furrow uphill with a two-way plow. This method produces a rough surface and eliminates dead furrows and back furrows in the plowed strip.

Adjust the tractor wheel spacing and corn planter so that the corn is planted in the tractor wheel tracks. Within 2 days after plowing, plant the corn. The soil between the rows will be in a rough, highly absorptive condition.

Wait until the corn is 6 to 8 inches tall before cultivating. Two culti-



Experimental control plots at the La Crosse station furnish data on soil erosion and water runoff. (Courtesy of University of Wisconsin.)



Crop rotation reduces soil loss.

vations should be sufficient for normal weed control.

Tests in the Fayette soil area show that yields will be equal to those obtained by preparing the seedbed in the conventional way. Soil losses, however, will be greatly reduced. In addition, the cost of producing a crop of corn is reduced.

MULCH TILLAGE.—Prepare the seed-bed with a large field cultivator. Do not plow. The soil surface will

be rough, trashy, and resistant to erosion. In the Fayette soil area it is necessary to begin this cultivating in August or September in order to kill the grass in hay fields. Cultivate shallow the first time over the field. Wait a few days until the loosened vegetation and soil are thoroughly dried out. Then cultivate only if it is necessary to control any weed growth. If the machine is adjusted to dig a little deeper at each cultivation, soil will be stirred up to the normal plowing depth.

Plant the corn in the spring as soon as the soil is in a workable condition. Use a regular planter; no special adjustments are needed.

Corn yields are not affected by this type of seedbed preparation. Soil losses, however, are reduced about one-fourth.

Grain

If the grain follows corn, delay plowing the land until late fall. Plow on the contour; turn all furrows uphill. If the plowing is done properly, the soil surface will be quite rough and capable of trapping snow and runoff water. This adds soil moisture and decreases erosion.

Prepare the seedbed with a field cultivator. Studies show that one cultivation should be sufficient for satisfactory yields. Do not cultivate unless weed control is necessary.

Soil losses from grainfields can be greatly reduced by planting the grain after hay in the rotation. Prepare the soil by plowing or by using a field cultivator. If you use a cultivator, start the work early enough to kill the legumes and grasses in the fall.

Measurements show that runoff losses from fields planted to small grain following corn are over twice as great as losses from fields planted to grain following hay. Soil losses are 5 times as great.

Grain yields average 9 bushels per acre less if the grain crop follows hay.

The mulch tillage method may also be used for planting grain. Cultivate to a depth of 5 or 6 inches with a field cultivator soon after the corn is harvested in the fall. Normally, 1 cultivation in the fall and 1 in the spring should produce a satisfactory seedbed for grain and legume seeding.

The yield of oats in this area has averaged 4 bushels per acre more from fall plowing than from preparing the seedbed with a field cultivator. Soil losses are reduced about one-half by using the field cultivator.

Legumes and grasses

Either corn or small grain may be used as the companion crop for seeding legumes and grasses.

When grain is the companion crop, use a grass seed attachment on the grain drill. It is not necessary to use a spike-tooth harrow or cultipacker after seeding. Tests in the Fayette soil area show these machines do not increase the stand of legumes if the seeds are planted shallow.

When corn is the companion crop, corn rows should be spaced about 60 inches apart. Corn in standard spaced rows offers too much competition for the grass and legume seeding.

Make seedings with a high-clear-

ance grain drill equipped with packing wheels. The wheels pack the soil firmly around the shallow-planted legume seed. This helps to give the seed a good start.

If you prefer, make seedings with a cultipacker seeder narrow enough to fit between the corn rows. Its use helps to get good stands, even in relatively dry soil. The packing operation is important because the soil between corn rows may be quite dry.

An ideal combination for getting better erosion control on sloping land is the plow-plant system and interseeding in corn. The land is protected with the hay crop until near corn planting time. When the corn is small, the rough, highly absorptive condition of the soil surface diminishes erosion and water runoff. Actually, the soil is unprotected with sod for only 2 months.

Tests with the interseeding method indicate that legume stands are nearly as good as those obtained by seeding in grain.

CONSERVATION AIDS

High fertility

An important part of any conservation practice is a good fertility program. This is especially true for the highly erosive, sloping Fayette soils. The more rapidly a crop grows, the sooner the soil will be protected against the beating action of the rain.

Fertilize all crops according to their needs as indicated by periodic soil tests. Fast-growing and high-yielding crops reduce runoff and erosion.

Contour stripcropping

The first step in setting up a stripcropping system on a field is to determine the rotation and the strip width necessary to control erosion.

ROTATION.—Plan a rotation in which the land is in hay at least half the time. A two-crop system in any one field is recommended—corn and hay, or grain and hay. This system cuts down on the time required in moving machinery between fields, and also gives better erosion and runoff control.

STRIP WIDTH.—The strip widths depend on the steepness of the slope, varying between 50 and 100 feet. Strips may be laid out on the exact contour, or at a 2- or 3-percent grade toward a waterway.

Strips graded toward a waterway give better erosion control because, during heavy rains, each row tends to divert the runoff toward the protected waterway. Some overtopping of the corn rows may occur where the strips are laid out on the exact contour.

In any stripcropping system there is always some movement of soil from the corn and grain strips during severe storms. Alternate strips of legumes and grasses spread out the runoff, reduce its velocity of flow, and filter out most of the soil in the runoff. Stripcropping reduces soil loss to one-half of that resulting from the same rotation planted on the contour without stripcropping.

Stripcropping controls erosion if the slope is not more than 250 feet long. Longer slopes need terraces or diversions to reduce the length of the slope.

Strip cropping on this Wisconsin farm reduces soil losses at least 50 percent. (Courtesy of Successful Farming magazine.)

Field terraces

Properly constructed and maintained terraces are permanent erosion control structures. Runoff water flows only a short distance before it is intercepted by a terrace channel. The channel leads the water slowly off the field to a protected outlet. Watershed studies at La Crosse show that soil losses from an unterraced, contoured field are six times greater than from a terraced field cropped to the same rotation.

Terraces on farms in the Fayette soil area should have a channel grade of 5 inches per 100 feet. They should be as nearly parallel as the field topography permits.

A terrace can be constructed at low cost with a farm tractor and plow. The channel grade and ridge height should be uniform throughout the entire length of the channel. Low and high spots in the channel reduce the water-carrying capacity and cause wet spots. Low spots in the ridge cause overtopping and unnecessary erosion.

Maintenance of a terrace is easy, but very important. Heavy rains often wash soil to the terrace channel. These soil deposits can be removed by plowing in such a way that a dead furrow is in the channel and a back furrow on the ridge. Generally, one maintenance plowing per rotation is sufficient. Turn furrows uphill with a two-way plow.

Terraces constructed at the La Crosse station in 1932 still had ample water-carrying capacity 25 years later. They have been maintained by plowing as outlined above.

Terraces soon pay off with increased crop production. Yield data show that terraced fields produce about 7 percent more crop than unterraced, contoured fields.

Diversions

Diversions are built similar to terraces. They have greater water-carrying capacity and are maintained in a sod crop most of the time. The channel grade may be as steep as 2 percent. Diversions are used to divert water in gully control and to reduce slope length in stripcropping, particularly valley slopes.

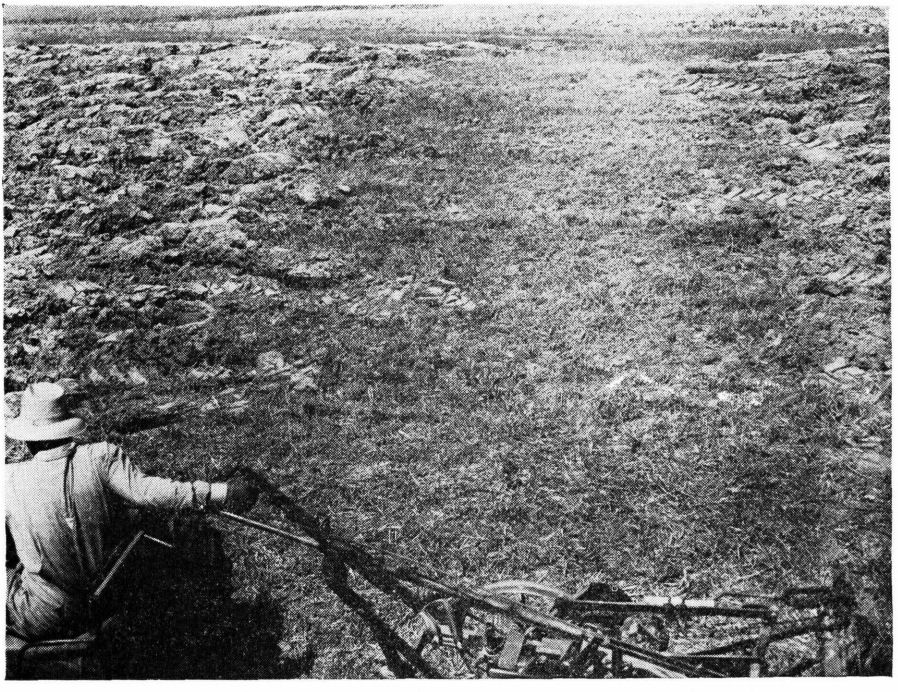
The volume and flow velocity of runoff water in diversions are normally so large that the channel and ridge must be maintained in a sod crop.

Outlets

A water outlet is necessary on fields where terraces and diversions collect runoff water. An outlet carries the water down the slope and prevents further soil erosion.

Some fields have natural waterways that make suitable outlets. Other fields may be located next to a pasture, which may serve as an outlet. If a suitable natural outlet is not available, construct an artificial one.

Seed the outlet to provide a dense sod cover by the time the terraces are built. Capacity of the outlet should be large enough to carry off runoff water from heavy rains. Do not build outlets near obstructions that may cause excessive amounts of snow to accumulate in the



This natural waterway on a sloping field gives extra protection from heavy rains. (Courtesy of Successful Farming magazine.)

channel. Locate the outlet on a slope facing west or south if possible. These slopes thaw first in the spring. Therefore, outlets are free to carry runoff when the major part of the field thaws.

Keep channels mowed or pastured to discourage rodent infestation. But do not pasture channels when the soil is wet enough for livestock to damage the sod. Examine grass channels frequently, especially after a heavy rain. Repair any damage at once.

Pasture renovation

Pasture improvement is one of the most profitable opportunities open to farmers in the Fayette area. Many pastures are located on steep land that has never been limed or fertilized. Forage yields are low; the soil is very compact from constant trampling by the livestock. Bluegrass yields fairly well in the spring. But by June production drops off to the point where the available feed limits milk production.

All these pastures located on slopes of less than 30 percent can be twice as productive if they are properly renovated.

Pasture renovation includes killing the existing vegetation, liming, fertilizing, and seeding to productive legumes and grasses.

Since most pastures are too steep for plowing with a turnplow, dig up the soil with a field cultivator in August or early September. Do not cultivate too deep. After the loosened vegetation and soil have dried out, cultivate again to a depth of 4 or 5 inches. Cultivate a third time if necessary. This method of renovation causes little soil loss because it leaves a mulch on the soil surface.

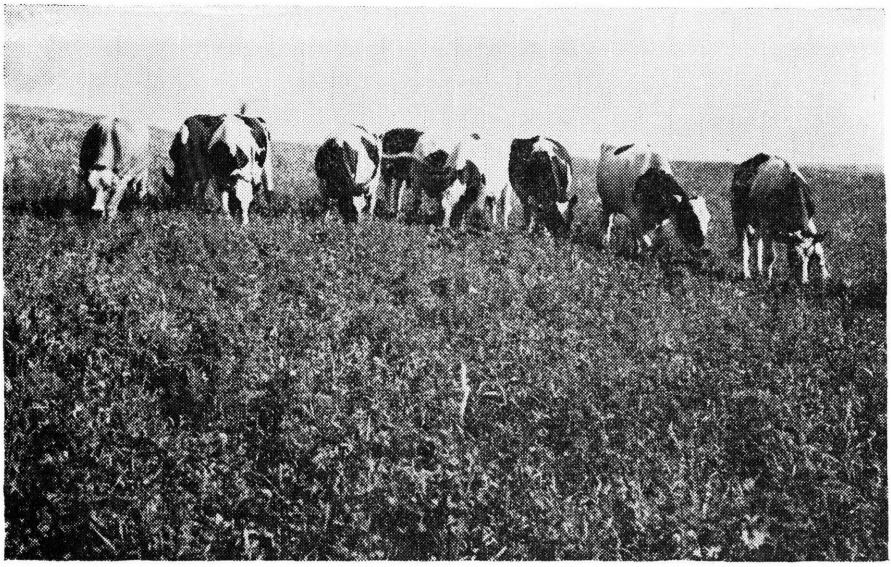
Chemical renovation is well adapted to this area. Spray pastures with approved herbicides in early September. Two weeks after spraying, cultivate with a field cultivator to a depth of 4 or 5 inches. Normally, 1 herbicide application and 1 cultivation should be adequate.

Take samples of the pasture soil and have them analyzed to determine lime and fertilizer requirements. Apply lime in the fall before cultivation.

In the spring, as soon as soil conditions are suitable, seed the area with alfalfa, Ladino clover and bromegrass. Use oats as the nurse crop. The oats may be harvested for grain or it may be grazed. Intensive grazing, however, may damage the young legume seedlings. Pasture the area only moderately the first year after seeding. If it is not overgrazed, the pasture will remain highly productive for 5 or 6 years.

Tests show an unrenovated bluegrass pasture yields only about 1¼ tons of forage per acre per year. Renovated pastures averaged 3.2 tons per acre per year for a 5-year period. Both areas received the same fertilizer treatments. A greater increase in yield would have been expected if the renovated pasture were compared with the average unfertilized bluegrass pastures.

Tests also show that renovated pastures give better runoff and erosion protection than bluegrass pastures.



A herd of Holstein cattle grazing on a renovated pasture in the Fayette Soil area. (Courtesy of University of Wisconsin.)

Managed woodlands

Much of the land in the Fayette soil area is suited only for timber production. Grazed woodland produces neither good pasture nor good timber. Pastured woodland actually allows more runoff than open pasture. Cattle grazing in the woods destroy leaf litter, eat small seedlings, and obtain less than one-third as much feed as from an open bluegrass pasture. Woodland that is maintained solely for timber protection produces a soil surface protection that is capable of absorbing intense rain without runoff.

On most farms in the area, a complete pasture renovation program will eliminate the need for grazing timberland and at the same time will provide more forage for livestock than the old system of grazing bluegrass and woodlots. Livestock spend little time in the woods when ample grazing is available on a renovated pasture.

To obtain maximum returns from farm woodland, harvest the timber the same as any other crop. Remove diseased and damaged trees promptly. Harvest only mature trees. A sound timber management program decreases runoff and may add materially to the farm income.

Other aids

The county agricultural agent and the soil conservation district office in your county are ready to provide assistance in planning a conservation program for your farm. The soil conservation district office will design and lay out stripcropping and terrace systems and recommend a crop-rotation and soil-management program for your individual farm. Consult these specialists for help in solving your soil and water conservation problems.

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